भारतीय मानक
Indian Standard

IS 2690 (Part 1) : 2023

पक्की मिट्टी की चपटी टैरेस टाइलें — विशिष्टि

भाग 1 मशीन से बनी

(तीसरा पुनरीक्षण)

Burnt Clay Flat Terracing Tiles — Specification

Part 1 Machine Made

(Third Revision)

ICS 91.100.25

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March 2023 **Price Group 5**

Clay and Stabilized Soil Products for Construction Sectional Committee, CED 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Clay and Stabilized Soil Products for Construction Sectional Committee had been approved by the Civil Engineering Division Council.

Burnt clay flat terracing tiles, which may be machine-pressed or machine extruded or hand-made, are used for flat roof finishing over lime concrete or cement concrete base, and depending on the degree of protection necessary, they are used in two or more courses. This standard was first published in 1964 and subsequently revised in 1975 and in 1993.

The standard is available in two parts. The other part being:

Part 2 Hand-made.

The main modifications incorporated in this revision are as follows:

a) The provision to incorporate agro residues/industrial by products in the raw material for tiles has been added.
b) The requirement of water absorption and flexural strength of the tiles have been modified.
c) The procedure for sampling of the tiles has been modified.
d) The reporting of the test results has been modified.
e) The condition for assuming constant weight of the sample during testing has been added.
f) The required loading for determining flexural strength has been modified.
g) The permissible number of defectives for visual and dimensional characteristics has been defined.
h) The accuracy of all reported test results has been defined.
j) The formula for flexural strength has been modified for uniformity and to reflect the standard units.
k) The diagram for setup of testing of flexural strength has been modified to increase clarity.

In this revision of the standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

The composition of the Committee responsible for the formulation of this standard is listed in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BURNT CLAY FLAT TERRACING TILES — SPECIFICATION

PART 1 MACHINE MADE

(Third Revision)

1 SCOPE

This standard (Part 1) lays down the requirements for machine-made burnt clay flat terracing tiles.

2 REFERENCES

The standards listed below contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 2248 : 1992	Glossary of terms relating to structural clay products (*second revision*)
IS 5454 : 1978	Methods for sampling of clay building bricks (*first revision*)

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 2248 shall apply.

4 GENERAL QUALITY

The terracing tile shall be made from suitable clay of even texture and shall be uniformly well burnt. They shall be uniform in shape and size and shall be free from irregularities, such as twists, bends, cracks and particles of stones. The face of the tile shall be either plain or grooved but the back of the tile should be corrugated so as to adhere to mortar.

NOTE — The clay may be blended with industrial by-products and/or agro-residues while ensuring that the final product confirms to the requirements of this standard.

5 DIMENSIONS, SHAPE, TOLERANCES AND WARPAGE

5.1 The size of terracing tiles and the tolerances shall be as given in **5.1.1** to **5.1.4**.

5.1.1 *Length*

150 mm to 250 mm in the stages of 25 mm.

5.1.2 *Width*

100 mm to 200 mm in the stages of 25 mm.

5.1.3 *Thickness*

20 mm and 15 mm.

5.1.4 *Tolerances*

The tolerances in length, width and thickness shall be ±2 percent in the case of machine pressed tile and ±3 percent in the case of machine extruded tile.

5.1.5 The permissible number of defectives for visual and dimensional characteristics shall be as per IS 5454.

5.2 Warpage

5.2.1 The maximum warpage for the tiles measured as described in **5.2.2** shall not exceed one percent of the dimensions in any direction.

5.2.2 Place a straight-edge flat over the tile resting on a plane surface so as to leave maximum gap between the straight-edge and the surface of the tile, as judged by naked eye, insert the measuring metallic wedge in the gap and measure the maximum value of gap.

6 WATER ABSORPTION

The average value of water absorption of all six tiles when tested by the method described in Annex A shall not exceed 10 percent. The individual values shall not exceed 11.5 percent.

7 FLEXURAL STRENGTH

The average value of modulus of rupture in bending of six tiles when tested by the method described in Annex B shall not be less than 2 N/mm^2. The individual values shall not be less than 1.7 N/mm^2.

8 SAMPLING AND TESTING

8.1 Procedure for Sampling

For conducting the tests specified in **6** and **7**, the sampling may be as per IS 5454.

8.2 Tiles shall be tested for water absorption and flexural strength in accordance with **6** and **7**. If any of the tiles in the sample fails to comply with the requirements of any of these tests, another sample shall be similarly drawn and tested. If any of the tiles in the second sample also fails to comply with requirements of any of the tests specified in **6** and **7**, then the whole lot, from where the samples were taken, shall be rejected as not complying with this standard.

9 MARKING

9.1 Each terracing tile shall be legibly and indelibly marked with indication of source of manufacture; the marking shall not cover more than five percent of the area of the specimen. The tile be also marked by letter ‘M’ to indicate machine made.

9.1.1 Each terracing tile may be marked with the Standard Mark.

9.1.1.1 The terracing tiles conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations framed thereunder, and the terracing tiles may be marked with the Standard Mark.

ANNEX A

(*Clause* 6)

WATER ABSORPTION TEST

A-1 TEST SPECIMEN

Tiles for this test shall be chosen from the sample selected in the manner described in **8**.

A-2 PROCEDURE

Dry the tiles in a hot air oven at a temperature of 100 to 110°C till they attain a constant mass such that two consecutive mass taken at an interval of 2 h shall not vary by 0.05 percent and then allow them to cool down at ambient temperature such that they attain room temperature; and immerse the dry specimen completely in clean water at 24 to 30°C for 24 h. Remove each specimen, wipe off the surface water carefully with a damp cloth and weigh the specimen correct to a 1 g within 3 min after removing the specimen from water.

A-3 CALCULATION AND REPORT OF TEST RESULTS

A-3.1 The percentage water absorption shall be calculated as follows:

$$\text{Percentage water absorption} = \frac{(B - A)}{A} \times 100$$

where

B = Mass of the specimen after soaking in water for 24 h, and

A = Mass of the dry specimen.

A-3.2 The percentage water absorption of the tiles shall be calculated to the nearest 1 decimal place. All the individual values as well as the average shall be reported.

ANNEX B

(*Clause* 7)

DETERMINATION OF FLEXURAL STRENGTH

B-1 TEST SPECIMENS

Tiles for this test shall be chosen from the sample selected in the manner described in **8**.

B-2 APPARATUS

B-2.1 The apparatus (*see* Fig. 1) shall consist of two parallel self-aligning cylindrical steel bearers, with the bearing surface rounded to 40 mm diameter, and so placed that the distance between the centres can be altered. The load shall be applied through a third steel bearer of similar shape placed midway between the parallel to the supports. The length of all the bearers shall exceed the maximum width of the tile under test for square and rectangular tiles.

B-2.1.1 The loading device may consist of a bucket connected either directly or through levers to the loading arm. The loading shall be at a uniform rate of 7.5 to 9.0 N/s. Provision shall be made to arrest the flow of lead shots immediately as the tile breaks.

B-2.2 Alternatively, a compression testing machine with a minimum load frame capacity of 10 tonnes may be used (*see* Fig. 2). In this system, the bearer assembly shall be mounted on a rigid mild steel plate and the third central loading bearing shall be fixed through a suitable dial micrometer having (least count 0.25 mm) or an equally sensitive device to bear on the loading member or on the specimen at mid span. The specimen shall be supported on the bottom parallel bearers separated by a distance of minimum three fourth of the length of the tile.

B-2.2.1 The error on the load reading shall not exceed 2.2 N for loads up to 220 N and for greater load the error shall not exceed one percent of the maximum load. The rate of loading shall be uniform and shall vary in the range of 7.5 to 9.0 N/s.

B-3 PROCEDURE

B-3.1 Test the tiles as described in **B-3.1.1** and **B-3.1.2**.

B-3.1.1 Immerse the tiles in water at a temperature of 27 ± 2°C for 24 h.

B-3.1.2 Support the tile evenly flat-wise on the bearers set, with a span equal to three-fourths the dimensions of the tile and resting on the natural bottom surface. Rectangular tiles shall be supported along longer face. To ensure uniform distribution of load at supports, provide suitable packing between the tile and the bearers. Apply the load with the direction of the load perpendicular to the span at a uniform rate of 7.5 to 9 N/s.

B-4 CALCULATION AND REPORT OF TEST RESULTS

B-4.1 The flexural strength shall be calculated for each individual tile by the following formula:

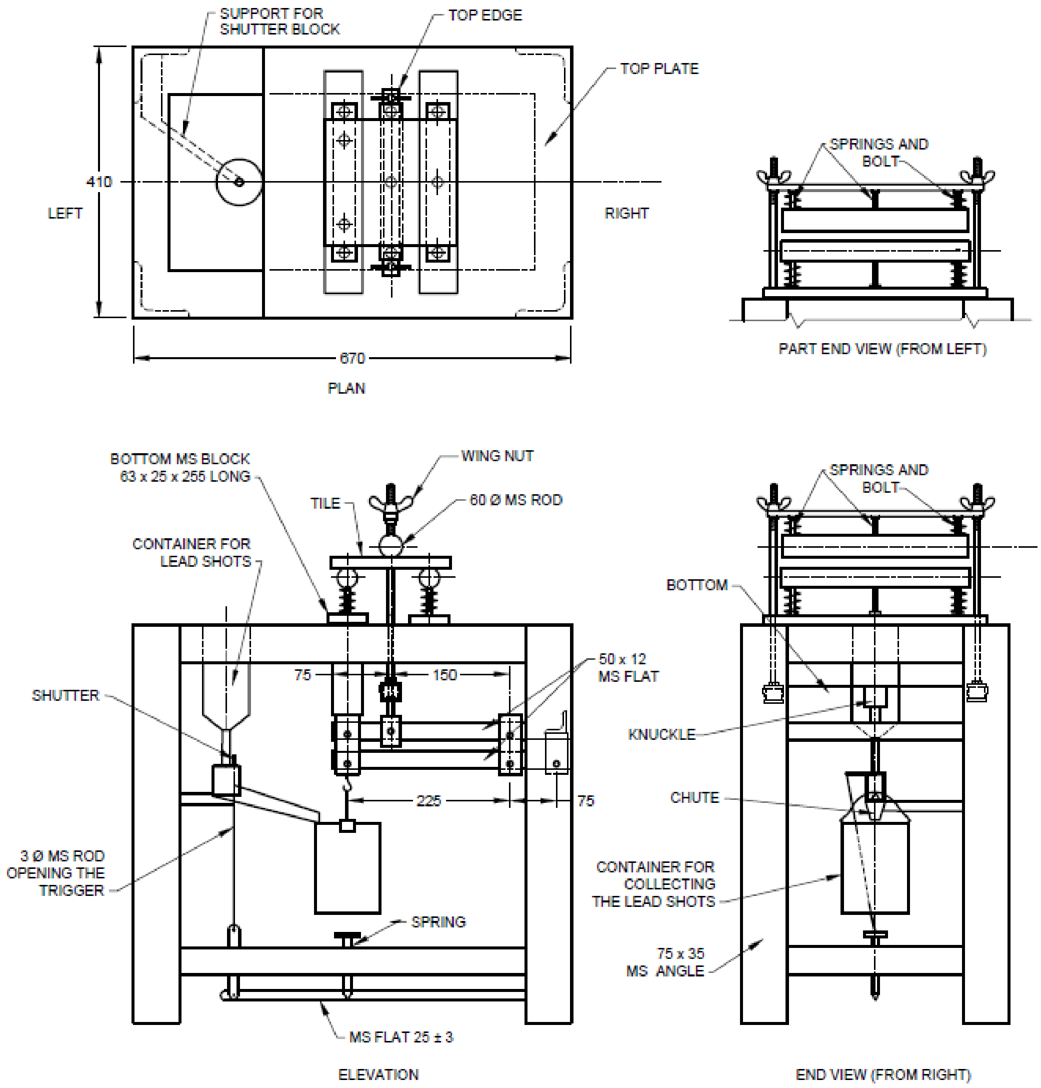
$$F = \frac{3Pl}{2BD^2}$$

where

F = Flexural strength of the tile, in N/mm^2;
P = load, in N;
l = span, in mm;
B = width of the tile, in mm; and
D = depth of the tile, in mm.

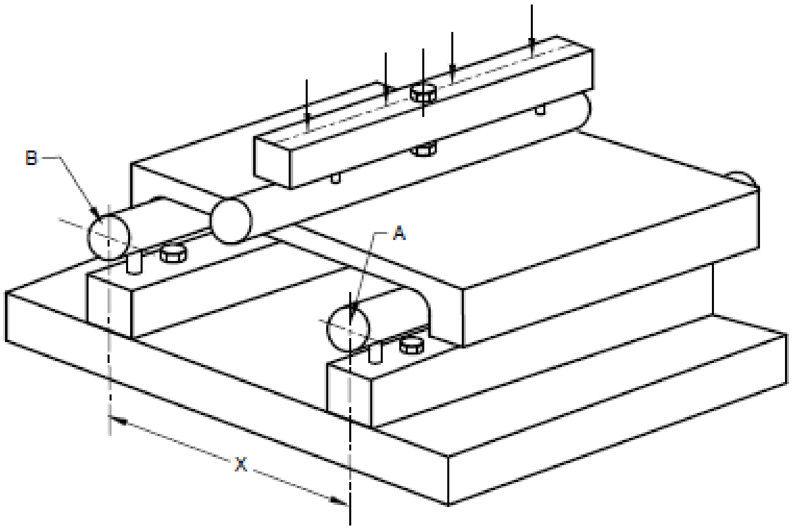
NOTE — While using the setup as per Fig. 1, P shall be taken as the product of mass of lead shots and lever arm.

B-4.2 The value shall be calculated and reported to the nearest 0.1 MPa. All the individual results as well as the average shall be reported.

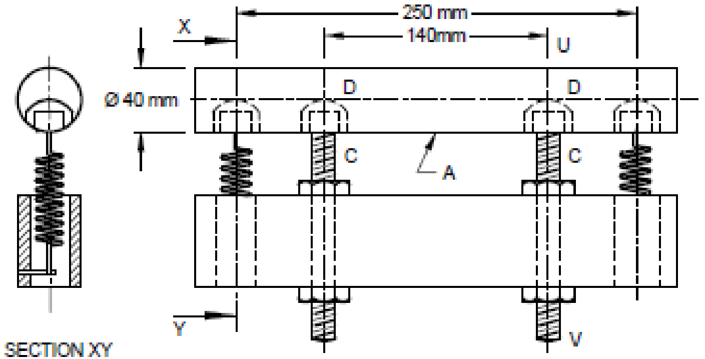


All dimensions in millimetres

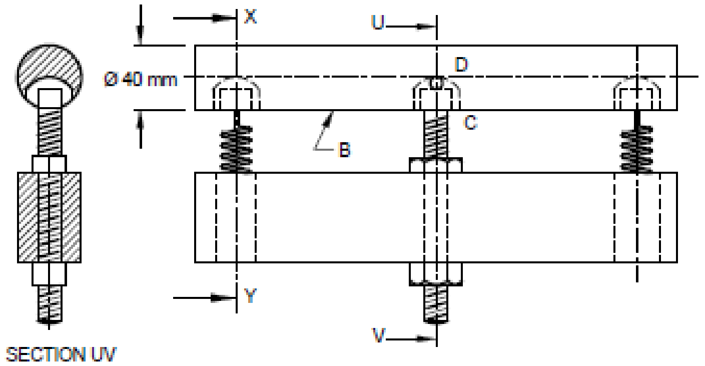
FIG. 1 TILE TESTING MACHINE (FOR THE DETERMINATION OF FLEXURAL STRENGTH OF ROOFING TILE)



X = SPAN AS PER TILE SIZE



DETAIL OF BEARER A



DETAIL OF BEARER B AND LOADING SUPPORT C

All dimensions in millimetres

FIG.2 ESSENTIAL OF APPARATUS FOR TRANSVERSE TEST

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Clay and Stabilized Soil products for Construction Sectional committee, CED 30

Organization	*Representative(s)*
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